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LANCASTER, PA. NEW BRUNSWICK, N. J.

ADVERTISING THE POTATO

The potato growers must give some thought to consumption of their product. In recent years they have given careful consideration to production methods with the result that there has been a marked increase in efficiency. Average yields have increased generally and 300- and 400-bushel yields are commonly reported. Production costs have been decreased and the quality of the crop has been improved.

During this period, when the grower was thinking in terms of bigger and better yields, little attention was given to the consumption of the crop. On the basis of total production there have been only slight changes in the past twenty years. During this period there has been an increase of approximately twenty millions in our population. Despite this fact there has been no shortage of potatoes. As Mr. Dickey points out in his article on potato consumption, in this issue of the AMERICAN POTATO JOURNAL, the decreased demand for the potato cannot be attributed to the depression, rather it has been the result of a decided change in our diet. This has come about to a large extent from the fact that the potato industry has been asleep while manufacturers of substitutes have used every available means of advertising their products.

The potato grower must awaken to the situation. He must not only make every effort to produce a high quality product at low cost but he must keep this product before the consuming public. In order to do this he must be organized. You have an organization—it is to your advantage that you support it. The potato growers should ask themselves this question: The potato has eyes, have we? A serious effort to call the public's attention to the value of the potato in the diet would unquestionably result in greater consumption and improved conditions in the industry.

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ARTIFICIAL LIGHT AS AN AID IN POTATO BREEDING

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One of the greatest difficulties encountered in potato breeding which involves the production of true seed is the marked sterility or lack of fruitfulness very generally present. This has been experienced by all who have tried to breed this plant. Many observations have been made with reference to the various aspects of fruitfulness, and numerous views have been expressed regarding the causes and conditions involved. Clark (1) enumerates four different causes of sterility:—Sterility due to premature abscission of buds and flowers; sterility due to pollen abortion; sterility due to hybridity and sterility resulting from incompatability. Premature abscission constitutes a very effective type of sterility since it is obvious that buds which fall before opening or flowers which persist for only a few hours cannot produce fruit. When the expression of this condition is not very pronounced so that a few flowers open and persist for a few days, under favorable climatic conditions they may produce fruit when pollinated with viable pollen. The anthers of such flowers produce but little pollen which rarely, if ever, is viable.

In the cultivated varieties of *Solanum tuberosum,* pollen sterility is very strongly manifested. This condition appears to be inherent in the species. Stout and Clark (3) studied the pollen of 170 commercial varieties and 513 seedling varieties representing material from many parts of the world. They failed to find a single variety in which there was not a fairly large percentage of sterile pollen grains. Of 7 wild species only 1, *S. commersonii,* showed the presence of this type of sterility to any marked degree. Subsequent cytological studies of this species have disclosed a meiotic behavior similar to that which occurs in known sterile hybrids, thus suggesting a possible hybrid origin of this form. Three conditions of pollen degeneracy have been demonstrated: (1) Shrivelled and empty pollen

grains; (2) hypertrophied or swollen grains; (3) absence of pollen grains.

In an attempt to ascertain, if possible, some of the causes for the high percentage of abortive pollen found in potato varieties Longley and Clark (2) studied the pollen mother-cell development of the cultivated potatoes and their allies. Their paper presents a study of the number and meiotic behavior of chromosomes in tuber-bearing forms of Solanum. Thirty-seven cultivated varieties of potatoes grown in the United States were found to have 24 chromosomes as their haploid number. The meiotic behavior of the chromosomes varied from regular in a few varieties to extremely irregular in many of the others. The few varieties with a regular chromosome behavior produced an appreciable amount of viable pollen; varieties with an irregular chromosome behavior produced practically no pollen which was viable. Unfruitfulness in potatoes would therefore seem to be associated with irregular chromosome behavior in meiosis.

While the degree of non-blooming and lack of seed setting varies with the variety it is also influenced by conditions of environment. This is shown in an experiment conducted by Stout and Clark (3) in which halved tubers of 15 varieties were grown, one set at Presque Isle, and the other set, consisting of the corresponding halves, at the New York Botanical Garden. All the varieties bloomed profusely at Presque Isle. At New York only 2 of the same varieties bloomed well; 3 produced a few flowers while 10 produced no flowers that opened.

During the season of 1930 naturally fertilized seed was produced by 18 seedling varieties of potatoes at Estes Park, Colo., at an elevation of 7,500 feet but only 3 of the same varieties produced seed at Presque Isle. Another striking example of the effect of environment is found in the potato breeding work in Minnesota. Potato seed cannot be produced on a large number of varieties and strains at University Farm, St. Paul, but many of the same varieties will produce seed at the Northeastern Branch Experiment Station at Duluth, and even better seed setting is obtained at Castle Danger 50 miles northeast of Duluth. The breeding plots in this case were in a field on the shore of Lake Superior.

Under other conditions plants bloom but rarely and potato balls are very seldom formed. If convenient locations can be found combining the environmental factors necessary for fruit production it is probably cheaper and easier to grow the parent material in the field and carry on the pollinating work in the open. Where such conditions are not available, however, it might be practicable to grow the material in the greenhouse and to supply as far as possible conditions which favor fruitfulness. As a preliminary step in this direction a

small experiment was conducted at Arlington Farm, Va., during the winter of 1931–'32.

OBJECTS

The objects of this experiment were three-fold; first to study the effects of different intensities of light on the growth, flowering habits and tuber setting of the plants; second, to obtain cytological material of several strains, and third to obtain seed.

MATERIAL AND METHODS

The strains of potatoes used in this experiment were chosen from their seed-setting record in the field at Presque Isle, Maine, in 1931. Ten numbered seedlings which produced varying amounts of naturally fertilized seed, and 10 others from the same progenies which produced no seed were grown. The variety Katahdin, which produces naturally fertilized seed under rather adverse conditions, and 3 yellow-fleshed varieties also were included in the experiment. On October 4 the tubers were treated, to break the rest period, with ethylene chlorhydrin gas, using 1 cc. per liter of air space for 24 hours according to the method described by Stuart and Milstead (4). After treatment they were stored at 70° F. On January 7 seed pieces showing vigorous sprouts were planted in 10-inch pots in the greenhouse. The temperature of the house was held as nearly as possible at 60° to 65° during the day and approximately 50° during the night throughout the entire period of the experiment. On February 11 the pots were divided into 3 groups, each group containing one or more of each of the seedlings and varieties grown. At this time the plants of all the strains but 3 were up, varying in height from 1 to 10 inches with an average height of approximately 3 inches. Each of the 3 groups contained 54 pots. A 1000 watt lamp was placed over one of these groups and a 500 watt lamp over another. The third group, used as a check, was given no artificial light. The groups were separated from each other and from the rest of the greenhouse by black sateen curtains hung on wires so that they could be folded back during the day. The plants were exposed to the artificial lights from 5:30 to 11:30 P. M. each day from February 11 until April 12.

PLANT HEIGHT

Plant height measurements were taken at three different dates,—February 11, the date on which the lights were started; on March 25 and on April 13. On February 11 the plants averaged approximately 3 inches in height. On March 25 the plants under the 1000 watt lamp averaged 36 inches, those under the 500 watt 38 and the checks 21. On April 13 the average heights were 52, 53 and 24 inches in the same order as before. The plants under each of the lights grew rapidly

from the beginning. They were abnormally tall but were very vigorous. The check plants, however, which were grown without artificial lights, were shorter, less vigorous and less uniform throughout the growing period.

TUBER PRODUCTION

The plants grown under each of the lights produced on the average the same amount of tubers. The average number of tubers per plant for these two groups was 7, with an average weight of one ounce each. The plants in the check produced 8 tubers per plant, each averaging one ounce in weight. The difference is probably not significant if the variability is taken into account. Tuber production then was affected very little, if any, by the application of artificial lights.

BLOSSOM PRODUCTION

Katahdin, which sets seed naturally fertilized under a wide range of conditions, did not bloom under the lights as well as was to be expected. Only 50% of the plants bloomed under the lights and then only sparingly. None of the Katahdin plants in the check produced blossoms. Ten of the seedling varieties, used in the experiment, produced naturally fertilized seed in varying degrees of abundance in the field at Presque Isle in 1931. Ten others produced no seed when grown under the same conditions. Of the first group 73% of the plants came to full bloom under the 1000 watt lamp, 68% under the 500 watt lamp and 5% in the check. The plants of the other group produced fewer flowers in all three of the lots. In this group only 20% of the plants produced flowers under the 1000 watt lamp, 20% under the 500 watt lamp and none in the check. It is interesting to note that the seedlings which produced naturally fertilized seed in the field produced more blossoms in the greenhouse test than did those which were not self-fertile in the field. The effects of light on the blossoming behavior is apparent in both groups.

POLLINATION AND FERTILIZATION

The pollen of six of the seedlings was examined under the microscope. In 3 of these strains the pollen was scant, in the other 3 it was fairly abundant. The percentage of good pollen was high enough in any of these to insure seed setting. No naturally fertilized seed was produced. Five flowers of 1 seedling were self-pollinated. Three seed balls were produced containing a total of 700 seeds. The plants of this variety grown in the check series without artificial light did not even produce flowers.

Several crosses were attempted between a variety with 12 as the haploid number of chromosomes and several of the cultivated varieties with $n = 24$. In each of these crosses seed balls were formed

which were normal in appearance but no seed was produced in any of them. Such crosses are difficult to make under any conditions since many similar attempts have resulted in failure to produce seed in the field at Presque Isle.

CYTOLOGICAL MATERIAL

Excellent cytological material was collected from some of the plants under the lights. None was obtained from the plants in the check group. Under the conditions which prevailed at Arlington Experiment Farm during the winter of 1931–'32 the application of artificial lights was essential then to the securing of satisfactory cytological material.

CONCLUSIONS

The application of artificial lights to potato plants in the greenhouse stimulated vine growth and blossoming to a remarkable degree. There was a high correlation between the naturally fertilized seed-setting record of the seedlings in the field at Presque Isle, and the extent of blossoming in the greenhouse under the lights. There was little difference in the effects of the 1000 watt and 500 watt lights. Smaller lights than these might produce the desired results.

The application of artificial lights facilitated the production of good cytological material. No naturally fertilized seed was produced.

Inbred seed was readily obtained under the lights by hand pollinating self-fertile plants. Seed balls, but no seed, were produced as the result of an attempted cross between two varieties, one of which had $n = 12$ chromosomes, the other $n = 24$.

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OUR CHANGING POTATO INDUSTRY

DANIEL DEAN

The history of the potato industry in the United States may be roughly divided into four periods; the first, from Colonial days to 1840; the second, from 1840 to about 1900; the third, from 1900 to about 1929 or 1930; and the fourth period beginning soon after the stock market collapse in 1929 and continuing through the present day.

During the first period the city and village population was very small compared to farm population. The Census of 1820 showed 86 per cent of the population gainfully employed upon farms while the 1930 Census showed 25 per cent on farms, 58 per cent in cities and balance in villages up to 3,000. In the early days, therefore, most of the potato crop was consumed upon the farm. A large proportion of the crop was made up of varieties too poor in quality for human consumption, and was used for feeding to cattle and hogs. This fact explains why the Census of 1840 showed the state of New York producing a crop of 30,123,000 bushels, more than present production.

Before the days of railroads the crop was either consumed upon the farm where produced, or within wagon hauling distance. Because of this marketing was based upon the personal contact of grower and consumer, quite different from present conditions where so large a share of the crop travels over 1,000 miles to reach a market.

The second period of potato production began about 1840, when late blight caused great destruction for a number of seasons, both in North American and in Europe. More than 200,000 people died in Ireland of famine or of diseases indirectly caused by the famine.

The late blight disease had far reaching results upon the potato industry. Great efforts were made to breed new varieties that should be immune to its ravages. Though this effort failed, the introduction of large numbers of new varieties resulted in the finding of a number that were of high table quality. The Garnet Chili, Early Rose, Burbank, Beauty of Hebron, Peachblow, Early Ohio, Bliss Triumph and Rural New Yorker Number Two in succession reached nation-wide popularity and distribution. Scarcely less popular were the Dakota Red, Irish Cobbler, Green Mountain, Early Michigan, Blue Victor, Pearl and hundreds of varieties now forgotten.

The younger potato growers can hardly believe how intense was the interest of the growers of thirty to sixty years ago in the constantly appearing new varieties. So many had already been successful and had each in turn supplanted preceding varieties that many, if not most, potato growers would each season buy and try out new varieties, frequently a dozen or more in a year. The introduction and dissemination of new varieties became a considerable industry. Older

growers will remember the seed catalogs offering many varieties, often accompanied by the most extravagant claims for high yield, fine quality and disease resistance.

William Stuart performed a great service for the potato industry by his group classification of American potato varieties (U. S. D. A. Bulletin No. 176). As a result of five years' tests (1909–1913) of thousands of varieties he found that most of the named varieties fell into eleven groups. The varieties within each group were so nearly alike that in most cases they would meet equally well either the grower's requirements as to climate and soil or the consumer's requirements as to appearance and table quality. One of the most striking developments of the last 20 years, since Stuart's work, has been the concentration upon one, two or at most three varieties or groups in each of our better potato producing sections. Lack of progress in our more backward sections is often due to the practice of growing and shipping such a diversity of varieties that a single carload will often contain samples of six or more of Stuart's varietal groups, varying as much in table quality as in appearance.

The success of numbers of varieties of real merit maintained the strong interest on the part of growers which caused the annual trial of new varieties and frequent replacement of seed stocks. Plant pathologists are not agreed as to the extent of the spread of virus diseases of the potato plant in the past, or at least as to whether such diseases were as severe as at present. It is probable that the constant spread of new seed stocks under the name of new varieties helped to reduce the amount of disease in the crop from 1850 up to the time of the use of certified seed in 1914–15. Even where commercial seedsmen sold stocks of old varieties under new names they would as a matter of business handle only stocks that had yielded well, and, therefore, were probably lower in disease than the stocks the grower was using.

The rapid growth of American cities after 1850, resulting from the use of machine tools in agriculture, increased the demand for potatoes for city markets to amounts greater than could be grown within wagon hauling distance, supplemented to a small extent by water transportation. Construction of a nation-wide railway system which was at once a result and a part of the agricultural revolution facilitated the start of a specialization of production in definite regions. Though a few of these regions, as Greeley, Colorado, might ship long distances, it is probable that the proportion of cars moving over 300 to 500 miles to market was small.

Potato marketing suffered from the number of varieties offered the consumer, varying widely in shape, color and quality. Most car-lot shipments were in bulk. Though shippers tried to keep varieties

separate, there was far too much mixture found in the final order purchased by the city consumer.

It is interesting to speculate as to the reason why so many new varieties came into use before 1900, and so few have reached wide popularity since. The Burbank Russet and Russet Rural almost make up the latter list. Two possible causes are the higher prices paid by consumers for those varieties which pleased them best, as for example Irish Cobbler, Green Mountain and Burbank Russet, and the development of high grade certified seed stocks of those varieties.

The third great period in the development of the potato industry began about 1900. The Census that year showed that 83 per cent of the potato crop was produced in the group of states extending from New Hampshire and Massachusetts westward to Nebraska and Kansas, and from the Canadian line south to Kentucky and Missouri. This group then as now contained most of our city population.

From 1900 to 1931, potato production in this group of states has actually declined from 227,328,000 bushels to 209,479,000 while the total crop increased from 273,328,000 bushels to 375,518,000. The outstanding development in this third period was the opening of new potato regions, in most cases located far from their markets, and the building up of a new system of distribution to handle the difficulties of marketing so far from the points of production.

Before 1900 Maine had but one crop as large as 10,000,000 bushels. Maine's 1931 crop of 50,960,000 bushels broke all state records excepting that of New York in 1914 with 53,315,000 bushels. Maine potatoes sold in cities over 2,000 miles from Aroostook County. High freight rates to distant markets have indirectly contributed to Maine's success by forcing high standards of grading. The heavy production of starch in low price seasons has also helped by removing at least part of the temptation to ship inferior tubers.

The most important single factor in the growth of the Maine potato industry has been its concentration upon two varieties, Green Mountain for main crop and Irish Cobbler for early, the former especially being of very high table quality.

Long Island has increased its production in this period to the limit of available potato soils, also using Green Mountains and Cobblers. These varieties have replaced others in the lower five New England states. The northeastern part of the United States together with the maritime provinces of Canada may be said to form a Green Mountain and Cobbler area.

Twelve southern states grew 14,675,000 bushels by 1900, 54,803,000 bushels in 1931. Florida in this period increased from 232,000 bushels to 3,640,000. The new crop grown mainly for sale in the northern

states has increased in even larger proportion because a considerable part of the crop in both years was grown for local use.

At the beginning of this period new potatoes in spring were almost a luxury in northern cities. Now they have largely replaced old crop potatoes in April, May and June. Many if not most of the groceries in large cities shift from old crop to new from two to three months earlier than they did thirty years ago. The number of carloads of old crop shipped in the month of May always exceeded that of the new until 1927. Production and shipment of new crop have increased so fast that in two recent seasons May shipments of carloads of new crop exceeded the old by over 5,000 carloads each year.

The 1900 Census showed production of 21,502,000 bushels in nine far western states against 60,276,000 for 1931. Idaho alone increased from 1,035,000 to 24,200,000 bushels. Idaho's Burbank Russet potatoes are shipped to cities as far apart as Los Angeles and Boston. The "Big Idaho Baker" once known as an advertisement for western railroad dining-cars is now used from the Atlantic to the Pacific. Other western varieties as Red McClure, Brown Beauty and Bliss Triumph each have their own markets.

Study of the economic history of the United States since 1900 shows a close relation between these changes in the potato industry and the ability of city consumers to pay large premiums in price for potatoes of high quality. The period of greatest prosperity ending in 1929 was also marked by the great increase in the use of other foods of high quality and price as cantaloupes and head-lettuce from California. There is little doubt that potato consumption per capita has slightly declined from 1920 to 1930 after having gradually increased during the previous half century.

The growers in the older potato-growing states were not only forced to reduce production but in most cases saw their potatoes discriminated against in the markets of their own cities in favor of potatoes from the newer regions that better met the higher standards of consumers in regard to quality and grading. Considerable areas in the corn belt states and in eastern New York cut their production to less than that needed for local use and became importers instead of exporters of potatoes. Often the local increase in prices resulting from the shift to a deficit area basis was not sufficient to maintain production at the old rate.

Market preference for the potatoes shipped by the newer regions does not fully account for all the changes. Low cost of production in some of the newer regions was also important. Large-scale production by the use of the latest labor-saving machinery has placed the potato in sections like Aroostook and Long Island on the basis of manufacturing industries of the cities.

High standards of grading, enforced by high freight rates to distant markets reacted to increase demand. Idaho has revolutionized the principles of potato grading by using a number of different grades, each adapted to meet the cost of transportation to a particular market, and ranging from the boxed and wrapped bakers shipped to distant New England cities to the Number Twos shipped to markets least able to pay high prices.

Very heavy demand from chain stores has been a strong factor in building up the potato business of the newer sections. Chain store merchandising methods are based upon the handling of large quantities of each product over long periods of time. Dependability as to variety, table quality and grading count heavily in favor of the newer potato sections. Lack of these qualities often counts against the older.

Loss of yield caused by the "running out" of seed potatoes grown in southern sections and on Long Island introduced the practice of buying fresh seed from northern states each season. By 1914–15 this demand was sufficiently heavy to cause the beginning of the practice of seed certification. Certified seed has so far outgrown its earlier demand that it now has almost as great an influence on the production of table stock in the northern states as in the south.

About 1920 the practice of applying fertilizers high in potash to peat or muck soils deficient in that element made practicable the production of very high yields on these soils. Rapid increase in the muck land crop is forcing a readjustment of acreage in those areas directly or indirectly competing with muck land sections, and it is safe to forecast that before 1940 a much greater readjustment will be necessary.

The fourth period of potato production in the United States began shortly after the panic of October, 1929. Deflation caused a distinct check to the great demand for the best potatoes at large price premiums over those less desired by consumers. This tendency was partly obscured by droughts in 1930 and 1931 over considerable areas that compelled heavy car-lot shipments from distant sections to fill up the local shortages. Similarly, loss of demand for southern new crop in 1932 was partly obscured by crop losses due to severe freezes and drought.

The 1932 crop marketing season to date has been very encouraging to the growers of the older states and very discouraging to those of the newer distant regions. Records of car-lot shipments show that up to December the growers of the older states have supplied a larger percentage of the demand than for years.

Transportation over stone highways by motor truck has favored those growers located within 200 miles of city markets. Whether operated by potato growers, by traveling buyers or by city produce dealers, truck transportation has reduced the cost of movement from

farm to market. Large-scale production, fertilizers, seed treatment, certified seed, improved machinery, better methods of cultivation and of spraying or dusting together with better methods of harvesting, storage, grading and marketing have operated to reduce cost and improve the product sold by the states of the older potato belt.

Forecasting the future is always difficult. It is safe to predict that the duration and severity of the present depression will exert a powerful influence on the readjustment of potato production and marketing to meet the new conditions unless either railroad freight rates or trucking costs or both are changed. Until economic conditions change greatly the distant car-lot shipping sections will be at a disadvantage.

Scientific work with the potato is often determined by the production and marketing methods of the local area within which the individual scientist works. For example, the American Giant grown in New Jersey till about 1921 was scab-resistant when grown on the alkaline soils in parts of that state. With the arrival of war prosperity city consumers refused to longer buy the Giant. After testing several varieties the New Jersey growers found that the Irish Cobbler fitted their climate and markets, but that it was often subject to severe scab when grown on alkaline soils. Extensive scientific work has enabled the production of Cobblers of good market quality and has resulted in the rebuilding of the potato industry of the state on a basis which compares favorably with those of other states of the older potato belt.

This example of scientific work forced by changing market conditions may be contrasted with two other famous potato problems due to plant diseases, the arrival of late blight and rot in Europe and North America around 1840 and the wart disease in England.

Potato research in the older producing states will be stimulated in the next few years by more favorable marketing conditions than before 1930. Directions such work will take may include the following:

1. The large-scale planting, cultivation and harvesting methods used by the newer car-lot regions.
2. Fertilizers and seed treatment, particularly in the middle west.
3. Breeding for new varieties resistant to virus diseases.
4. Extension of the use of certified seed and additional studies on the production of foundation stock.
5. Study of the problems peculiar to potato production on peat or muck soils, particularly those concerning keeping quality.
6. Demand for a smoother Cobbler for certain sections and possibly for an even earlier or a frost-resistant variety for large areas of peat now too subject to frost damage to be commercially used.

7. The large and tender foliage of the Green Mountain variety makes spraying difficult where either late blight or heat and drought are limiting conditions and will encourage better spraying methods.

8. Storage studies, more necessary in the warmer states than in the colder northern states.

9. New methods of marketing now being developed will force changes in production methods, particularly in harvesting.

10. It is safe to predict that the example of the newer potato regions in concentration on one or two varieties that are most in demand by consumers will be followed by the older potato regions.

POTATO CONSUMPTION IN THE UNITED STATES

J. B. R. DICKEY

Ever since 1928, the year of the big potato crop, growers who study the U. S. Crop estimates on potatoes have looked for increases in the price. This failed to materialize, or at least to anywhere near approach expectations. According to the old rule, when total production fell below 3.5 bushels per capita, or about 350 million bushels, the crop was short and a strong market with rising prices could be looked forward to. Of course, the depression was blamed for low potato prices and was to a certain extent responsible, although there was not, according to the figures, a large potato surplus bearing down the price. A little careful study shows that the depression was only partly to blame, and that there were factors going back much further which influence the amount of potatoes which will be consumed in this country per year. Since there can be no carry over and but little export it is most important for the potato grower to govern his acreage according to probable demand.

A little figuring on annual crop yields and population for the last twenty years throws some light on the question of average per capita consumption, or at least per capita production. The average production according to U. S. Department of Agriculture crop estimates for the last five years, 1927 to 1931 inclusive, was in round numbers 387 million bushels or an average of a little under 3.2 bushels per person. For the five years, 1922 to 1926 inclusive, it was 392 million or 3.47 bushels per capita; the five years preceding this, 1917 to 1921, it was 388 million bushels or 3.7 bushels per capita, while 1912 to 1916 averaged 364 million bushels or 3.73 bushels per person; cutting out the very short crop of 1916, the remaining four years averaged 3.95 bushels per capita. We have averaged just about the same total production for the last 20 years with a population increasing over a million per year, and yet, so far as we know, every one has been getting all the potatoes he wanted to eat.

In case one argues that the depression of the last three years has been largely responsible for the drop in the last five year period, let us try another grouping. Taking the five year period of 1924 to 1928 inclusive, which was a period of prosperity, the average was 3.38 per capita; 1919 to 1923, which included some lean years shows 3.65, while 1914 to 1918, years of high prices, give an average of 3.8; cutting out the short 1916 crop, the average was over 4 bushels. Here, again, we seem to get the same decided trend which cannot be laid to good times or bad. The last three years the average fell to 2.9 bushels per capita due to the combination of hard times and the general downward trend of consumption. A drop from 3.8 bushels per person to 2.9, on the basis of present population, means over a million bushels less potatoes required, or approximately a fourth of the total normal crop of the country.

Of a five year basis, with decreasing average production, average prices have held surprisingly close to $1 per bushel ever since 1914 when the general price level rose and until the drop of 1929. From 1914 to 1918, with a per capita production of 3.8, the average farm price was just about $1; from 1919 to 1923, per capita production 3.65, average price $1.03; from 1924 to 1928, per capita production 3.38, average price $1.08.

A little thought will reveal ample reasons for this reduced potato-consumption. It was not so long ago that potatoes appeared on the farmer's and working man's table nearly, if not quite, three times a day. After the season for home-grown vegetables was past potatoes were about the only thing of the kind available. Since then habits of diet have changed to a certain extent (no doubt for the better so far as health is concerned) in nearly all households. The cereal breakfast food has helped to crowd the fried potatoes off the breakfast table. Southern grown vegetables are now available nearly all winter in every town of any size, and at rather reasonable prices. They are being bought and eaten by nearly all classes, and since we eat only about so much we are cutting down on something else, with potatoes probably taking the largest share of the cut. The canning industry has expanded tremendously in the last fifteen years. Canned vegetables have also helped crowd the potato off the table. With the lower standards of living which formerly prevailed among the heaviest potato consuming classes, canned goods, fruits and vegetables were considered luxuries. Now they are taken as a matter of course as long as there is any money at all to buy them.

Another factor has been the female fear of superfluous flesh, and the universal placing of white potatoes in the class of the most fattening of foods; though they deserve this reputation no more than sweet potatoes, sugars, fats and cereals. If the housewife is afraid to eat

potatoes she is not very apt to serve them often for the rest of the family, provided she can substitute something in which she can herself indulge.

Lastly, our diet is generally lighter than it was a generation or less ago, there is less heavy manual labor and in all classes a tendency to eat less. A survey would probably show potatoes on the average present day table not much oftener than once a day.

Whether an article is over produced or under consumed is probably largely a matter of the point of view. If a group of manufacturers, or the producers of some special crop such as citrus fruit, saw the consumption of their product declining year by year they might be depended upon to use every available means of arresting the trend, otherwise they would have to prepare for overproduction and ruinous prices. The American people will eat only about so much, but there is now so much latitude as to what they may *choose* to eat that keen competition is coming into play. Some organized interests are already making strenuous efforts to influence this choice. One means is through advertising in papers, magazines and even on bill boards and window displays. These advertisements may set forth the purity, food value, vitamin content or the comparative economy and general desirability of their product from the standpoints of health and appetite. This publicity also serves another important purpose since it acts as a more or less constant reminder, directing and influencing the thoughts and desires of the housewife and the consumer.

Another excellent means of propaganda is the use of articles, particularly in the woman's magazines, written by authorities on food and dietetics,, explaining in detail the value and advantages of the particular product from a nutrition standpoint. For instance, potatoes contain certain essential vitamins, and are particularly high in salts which have a very beneficial effect on the system; but how many of the housewives who have the health of their families in mind know it? Articles of this sort are read, and have a very marked influence on the national diet.

Another good line is publicity given to recipes for the preparation of the product. The little booklet "77 Ways of Using Potatoes," distributed by the Pennsylvania Potato Growers some years ago, was a splendid idea. Consumers may tire of potatoes fried, baked or boiled. New ways of serving, however, may be just as satisfactory as a change to some other vegetable.

An illustration of what can be done to influence consumption of a common every-day product which every one knows about, or thinks he knows about, may be found in the dairy industry. "Dairy Councils," financed jointly by the producers and dealers, have carried on active publicity and advertising campaigns in several large cities.

The effect of such work is generally conceded to have resulted in a material increase in consumption of milk, butter, etc., as well as a more constant consumption. In one large eastern city which had no such work, consumption of milk declined 9 per cent as a result of the depression while in another large eastern city where a Dairy Council had been active for ten years consumption actually gained 2 per cent during the same period.

Considering the comparative cheapness of potatoes it would seem as if larger consumption should go along with periods of depression, but this does not seem to be the present case. Right now would seem a splendid time to bring the high food value per dollar of potatoes to public notice. It would be hard to find a single article of diet, regardless of price, which would more nearly supply all nutrition needs and which could be prepared in as many varied and appetizing forms.

Much might be written on the subject of quality in relation to consumption. No doubt poor quality reduces and good quality increases potato consumption somewhat, especially when times are good and on the part of discriminating classes. High quality should always be the aim of the grower, and soils which produce poor quality and ill-shaped tubers should be avoided. A crop of high quality should be well-graded and put on the market in an attractive condition. However, on account of adverse weather, and other factors beyond the grower's control, high quality is not always possible; in which case perfect grading and packing may not be practicable or economical. Poor appearance does not necessarily mean lower food value, and our largest potato consumers are not apt to be very particular or discriminating. Their principal interest is in getting the most for their money.

With potato associations all over the country representing the commercial growers it should not be difficult to inaugurate a national campaign to bring the potato more constantly and favorably to the consumer's notice as outlined in the preceding paragraphs. Not a campaign for the potatoes of any particular state, locality or brand, but simply a potato consumption movement in which all could join and from which all could profit equally.

The meat packer works to increase the use of meat, the baker pushes bread and the dealer advertises dairy products, but if anything is to be done for potatoes, the *producers* will have to do it. The retailer cannot be expected to take much interest in such a campaign, since if he does not sell potatoes he sells other things in place of them, on which he makes an equal or greater profit. He might be worked upon, however, to display potatoes more conspicuously and push their sale more actively instead of keeping them more or less in the background. There are between 3 and 3½ million acres of potatoes grown

in the country annually. How many are grown in a commercial way and how many are represented in growers' associations, it would be hard to say. A small assessment on an acre basis, however, would provide a sum of money which, wisely expended, should do much to arrest the downward trend in consumption. Some such movement should give the potato growers' associations renewed life and increased membership. It would furnish a common ground and common purposes on and for which they could all get together and work. The seed grower should be as much interested as the producer of table stock since their prices rise and fall more or less together and success for the seed man depends upon success for the market grower.

Potatoes are good, healthful, energy making food for man, woman and child. They can be prepared in many attractive forms, most of which the average cook never heard of. They are no more fattening than many other foods. They are the cheapest vegetable of equal nutritive value, and a lot of people today are looking for something cheap. We know these things, but half the consumers do not, and the other half needs to be constantly reminded. How about using some printers' ink as well as fertilizer, Bordeaux mixture and certified seed?

EFFECT OF SOIL REACTION ON THE GROWTH OF THE POTATO

ORA SMITH[1]

Soil reaction, or the degree of acidity or alkalinity of the soil, is one of the most important factors in potato production. It is important, therefore, for the grower to have some idea of the relation of soil reaction to the growth of the potato plant.

The reaction of the soil in which potatoes are grown may affect the potato plant in several direct and indirect ways. Most of us have realized for some time the importance of soil reaction in relation to the occurrence and severity of scab on the tubers. In fact, the presence of scab has commanded our attention to such an extent that many of us have forgotten or have given no thought to the effects of acidity or alkalinity of the soil on the growth of the plant itself. Because the reaction of the soil is known to influence the intake of nutrients by the plant from the soil, it is reasonable to expect that as we change the reaction of the soil we may also change the rate of growth of the plant, as well as the number of tubers which set, the size of the tubers and the total yield. By affecting the availability of nutrients in the soil as well as the rate and amount of absorption of each, soil reaction also may alter the table quality of potatoes by starch and moisture changes in the tubers.

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Experiments were carried on at Ithaca, N. Y., with the Smooth Rural variety grown in plots of six different soil reactions, each replicated five times. An equal number of seed pieces and same weight of seed per plot were planted on May 25, 1932. Each plot was 50×12 feet in size with guard rows between plots. The acidity of the soil was increased by the addition of sulphuric acid and decreased by broadcasting hydrated lime between the plowing and fitting operations. Soil reaction was determined before application of the sulphuric acid and hydrated lime and four times during the growing season. The extremes of soil reaction were pH 4.68 on the acid side to pH 7.45, slightly on the alkaline side.

Aside from the factor of scab prevalence, it has been widely accepted that potatoes would grow and yield best in a soil of acid reaction. Results of experiments conducted in Ohio by Bushnell (1) indicate that the yields of potatoes are reduced from 170 to 139 bushels per acre when lime has been applied to change the reaction of the soil from pH 4.8–5.0 to pH 6.8–7.5. In more recent experiments Bushnell (2) found that heavy liming, which changed the reaction of the soil from approximately pH 5.0 to 7.0, increased the yields from 200 to 224 bushels per acre. The probability is mentioned that the benefits to the potatoes are due more to the larger amount of soybeans plowed under than to direct effects of the lime itself. On Long Island, Wessels (3) found the greatest total yields of Irish Cobbler and Green Mountain tubers at a soil reaction of pH 5.2 to 5.6. On more acid and on less acid soils the yields were reduced. In the experiments at Ithaca, however, no reduction in yields were noticeable in soil up to a reaction of pH 7.45. As this was the most alkaline soil in which the potatoes were grown, we do not know at what reaction the yields would have started to decline.

The data in table 1 show that the total yields were reduced when the potatoes were grown in a soil quite acid, at a reaction of pH 4.68–4.90.

No significant differences in total yield were found when potatoes were grown in soils of the three highest pH ranges, that is, between pH 6.08–6.51 and pH 7.16–7.45. However, the yield of U. S. No. 1 tubers was significantly greater at the most alkaline reaction than at any of the acid reactions.

In the potato growing sections of Long Island and other Atlantic Coastal areas, soils are commonly found with reactions below pH 5.0. It has been shown by various workers that potatoes grown in soils below this reaction will produce lower yields than those grown at slightly above pH 5.0. In few other sections, however, are soils of reaction below pH 5.0 commonly found that are otherwise suitable for potato production. Because of natural underlying deposits of lime

TABLE 1.—*Effect of soil reaction on yield and market quality*

Soil reaction pH	Bushels per acre			Number scabby tubers per acre
	Total	U. S. No. 1	Scabby	
4.68–4.90	309	292	2.5	348
4.98–5.55	326	297	9.5	1,566
5.64–6.05	321	294	8.4	1,508
6.08–6.51	345	300	21.3	3,596
6.58–6.84	341	307	15.6	2,581
7.16–7.45	344	324	5.2	783

in some sections and also because of the common occurrence of potatoes in the same rotation with legumes which require liming for best growth, it is very common to find potatoes being grown in soils of rather high pH. Several years ago a survey was made by the Departments of Vegetable Crops and Agronomy of Cornell University on approximately 40 farms in a potato growing section of western New York. A great many of the potato soils tested were on the alkaline side and some even ranged as high as pH 8.0 and above. No lime had ever been added to many of these soils; they were naturally of this sweet character due to the underlying deposits of lime in this section of the state. As far as one could judge, these soils were producing yields of potatoes equal to those on soils of higher acidity.

EFFECT OF SOIL REACTION ON MARKET QUALITY

Most growers realize that the prevalence and severity of scab injury on the tubers is closely related to the reaction of the soil in which they are growing. It has commonly been thought that the more alkaline the soil, the greater would be the severity of scab and up to a certain soil reaction most experiments confirm this contention. The data of table 1 indicate that if the pH of the soil is further increased beyond pH 6.51 that the amount of scab decreases. The tubers grown in the soil with a reaction of pH 7.16–7.45 had less scab infection than those of any other plot with soil of a reaction above pH 5.0. The greatest amount of scab was found on tubers grown at a reaction of pH 6.08–6.51 with the amount decreasing as the soils are either more acid or less acid. Wessels (3 growing the Green Mountain variety on Long Island soils with reactions as high as pH 7.0 found that the amount of scab continued to increase up to pH 6.9 or 7. Further experiments in which potatoes are grown in soils with reactions above pH 7.45 are now in progress. It should be very interesting to determine the soil reaction at which the amount of scab will decrease no further or will again show an increase.

EFFECT OF SOIL REACTION ON TABLE QUALITY OF TUBERS

Considering tubers of marketable size (above 50 grams), the dry matter percentage in the tubers grown at pH 5.64–6.05, is higher, in most cases, than in tubers grown at the higher or lower soil reactions. The starch percentage, on the fresh basis, of the marketable tubers when grown in soil pH 7.16–7.45 was lower than that of tubers grown in the more acid soils. In general, the starch percentage of tubers grown at a soil reaction of pH 5.64–6.05 is higher than that of tubers grown at either the higher or lower pH range.

Any differences in starch and dry matter content of potato tubers may also affect their cooking quality. Mealiness of potatoes, when cooked, is due partly to the content of starch and moisture or the ratio between the two. Excessive mealiness often is undesirable in potatoes cooked by boiling because of the sloughing off of the outer layers resulting in the potato falling apart. Preliminary boiling tests indicate that immature tubers and tubers grown at a reaction of pH 7.16–7.45 are less objectionable on this point than mature tubers or those grown at a reaction of pH 5.64–6.05. In these experiments a relationship is indicated between better table quality of potatoes for boiling and a somewhat lower percentage of starch as brought about by immature harvesting or growth at soil reactions of rather high pH.

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CULTIVATING POTATOES UNDER WESTERN CONDITIONS

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Agronomists and Horticulturists are quite generally of the opinion that cultivation is essential for the attainment of three general objectives: 1—weed control; 2—the closing up of cracks which would serves as flues for carrying moisture out of the soil; and 3—to maintain the soil in a loose or crumbly condition so that it will readily absorb rainfall. The ultimate object of all of these is of course conservation of soil moisture. If the potato grower accomplishes these things as enumerated he need not be concerned further as to whether or not he is doing an adequate amount of cultivation. Frequently under the low rainfall conditions of the west, two cultivations are sufficient and it is very seldom that more than three are given. It is

not unheard of for a farmer to grow a satisfactory crop with only one cultivation. It must of course be remembered that when so few cultivations are given there are many weeks without any rainfall at all and weed growth is then very meagre.

The depth of cultivating is probably more important than the frequency of cultivation in so far as the potato crop is concerned. The main roots of the potato travel laterally for a distance of from 12 to 18 inches from the plant. For all of this distance they are seldom more than six inches deep and frequently within an inch or so of the surface of the soil. Very few of the roots head directly downward close to the plant. As a consequence if cultivation is very deep, at least if it is deep and close to the plants, a large amount of root pruning results. This root pruning represents quite largely irreparable damage. The potato plant does not send out new roots very readily at such points of injury. In this respect it is quite different from its close relative the tomato. Consequently after the roots are cut off the feeding area of the plant is greatly reduced and remains so until the plant produces a new quantity of roots.

In view of these objectives in cultivation and the nature of the potato root system, the following cultivation practice is generally recommended in regions of limited rainfall. The general principles involved will of course apply almost anywhere else. The principal variation in procedure in more humid climates should be to cultivate more frequently because of more frequent rains. Immediately after planting give the potato field a very deep blind cultivation. If the ground begins to crack at any time or if weeds begin to grow before the plants are through the soil, go over the field with a weeder or spike tooth harrow. As a matter of fact this procedure can be continued even after the plants are several inches above the soil. Some growers continue with a spring tooth weeder until plants are as much as 8 or 10 inches tall. If plants are turgid and easily broken the latter procedure is rather hazardous. The first cultivation which may frequently be given to the plants before they are more than about 6 inches tall should also be very deep in the middle between the rows, but the depth close to the rows should be governed by the lateral growth of the roots which should be determined by digging down and examining the root system of several plants. As the season advances all cultivation shall be more and more shallow and confined more largely to the space in the middle between the rows. In a country of low rainfall the soil should be kept practically level. The ridge over the row should be no higher than is necessary to protect the most shallow tubers from sunburning. High ridging is necessary only in case of poorly drained regions or where irrigation by the furrow system is to be used.

CROP AND MARKET NEWS

POTATOES SELLING LOWER THIS YEAR

By the opening of June, fully one-half more potatoes had been shipped from the South than a year ago, and during late May the movement was much heavier than that of last season at this time, averaging close to 400 cars per day. Most active States were South Carolina, Alabama, Louisiana and Texas.

Some improvement was noted in the condition of the early potato crop in the southern States, the reported May 1 condition being 76% of normal, compared with 72.5% on April 1. The commercial or shipping crop, in general, reflected a somewhat better condition than the farm crop of early potatoes for home or local use. Condition of the combined early crop was about equal to the average May 1 condition over a period of years and better than a year ago, when it was reported at 70%. This is also shown in the yield expectations reported for six of the earlier shipping States or areas, which indicate the possibility of 15% larger yields than a year ago, nearly counter-balancing the acreage reductions that were effected in these earlier commercial States.

Latest reports show that the early crop of potatoes in lower Rio Grande Valley of Texas was reduced to 927,000 bushels, thereby making the commercial production for that district and Florida together about 2,800,000 bushels, or 29% more than last year. The second group of seven early States has a commercial crop of about 6,600,000 bushels, or 6% less than in 1932. Most of the cut is in parts of Texas outside the lower Valley. Increases over last season are indicated for Alabama and South Carolina. Leading States are California with 2,243,000 bushels, Louisiana with 1,296,000, South Carolina with 1,023,000, and Alabama, with 944,000 bushels.

The commercial crop in four second-early States is forecast at nearly 5,000,000 bushels, or just 3% less than last season. North Carolina is increased this year to 3,900,000 bushels; Arkansas is reduced to 370,000 and a sharp cut in acreage in Oklahoma is bringing down the commercial crop in that State to around 600,000 bushels. Tennessee will be increased slightly to 112,000. Acreage of the commercial crop in five intermediate States was reduced to about 79,000, compared with nearly 92,000 acres last year. Missouri shows some increase of acreage, but considerable reductions are noted for Kansas, Kentucky, and Maryland, with Eastern Shore of Virginia reporting an acreage cut of nearly 20% compared with last season.

Old potatoes were near the end of their season, but daily output was still averaging around 250 cars. Round Whites were holding

firmly at 68 cents per 100 pounds sacked F.O.B. western New York points, but Maine Green Mountains were weak at 40 cents. Wisconsin shippers were getting 50 cents on sacked Round Whites. Idaho Russets recently were in a stronger position than any other potatoes, having reached a relatively high range of $1.65–$1.75 in the Chicago carlot market by the 25th of May, while northern Round Whites had strengthened there to 70–80 cents per 100-pound sacks. Maine Green Mountains had declined in eastern terminals to $.80–$1.25 on a jobbing basis.—(From BUREAU OF AGRICULTURAL ECONOMICS, U. S. D. A.)

SECTIONAL NOTES

MICHIGAN

For 14 years potato shows have had a definite place in the potato program of Michigan. Some 1300 potato exhibits are displayed annually at six district potato shows in the state, and are seen by several thousand growers. Educational features, such as, meeting, grading, judging and variety identification contests are considered of vital importance arousing the interest of all and giving a little zest to the affair.

Boys and Girls in 4–H Clubs and in Smith-Hughes classes have taken special interest in the contests, and in selecting samples of potatoes to enter in the show. Special classes are provided for the boys and girls and oftentimes nearly half the entries in the show are supplied by the young folks. Competition is keen between individuals and likewise between clubs or schools, so for several years instructors in Smith-Hughes work and leaders of clubs have instructed their boys and girls in selecting and judging potatoes. The Michigan State College has assisted the instructors by furnishing them score cards and samples of representative varieties. The matter of getting suitable potatoes, however, was sometimes different. Often the samples were needed before the potatoes were ready to harvest; also unfavorable growing conditions made it almost impossible to get potatoes of show type in some seasons. It was believed that many of the Smith-Hughes schools could benefit by having a set of models available at all times that would show their pupils typical potatoes of the standard varieties. With this in view, the best potato of each standard variety shown at the Michigan State Potato Show in 1928 was selected and plaster of paris models were made from them by the Denoyer-Geppert Company, Chicago. These models were seen by several Smith-Hughes teachers and met with their favor, so that in a year or so, some fifty sets of models were ordered by Michigan High Schools.

Last year demand for potato models came from a large number of growers, most of whom have had several years' experience in selecting show stock. They want a "perfect" potato that they can keep from year to year as a guide in selecting their show samples. During recent months there has been some organized effort on the part of County Agricultural Agents to obtain sets of potato models that they can take to the grower and show him what they mean by good type without having to do so much explaining. Potato models have met with favor in Michigan and their use will be extended in the next few years. —H. C. MOORE.

NEW YORK

Clean potatoes are becoming more and more important with the rapid increase in the use of small consumer packages such as 15 lb. open mesh bags, cartons and paper bags. Statistics show that clean potatoes have been bringing from 5¢ to 10¢ more per bushel, or $35 to $70 more per car. U. S. Dept. of Agriculture Market Report No. 40, issued at Rochester, N. Y., Oct. 18, 1932, quotes "100lb sacks U. S. #1 Round Whites @ 63–65¢; Brushed @ 68¢."

The Boggs Mfg. Corp., Atlanta, N. Y., are now equipping Power Graders with a new Brusher which will clean and polish potatoes and onions while it grades, at a speed of 250 bushels or more per day.

This Brusher consists of a series of brushes made of Chinese bristles and a series of cloth wipers. It is operated in conjunction with the Roller Picking Table for potatoes and with the Belt Table for onions.

Only a fraction of a horsepower need be added to the power required to operate the standard power grader. A complete No. 3 power grading and cleaning equipment requires only a ¾ H.P. electric motor or a 1 H.P. gas engine.

This cleaning unit operates on the floating principle. The weight of the brushes and wipers is compensated by the use of live rubber, consequently they automatically adjust themselves to the varying sizes of potatoes or onions being cleaned. In addition, there is a quickly operated manual adjustment which controls the minimum space between the cleaning units and the roller table. This permits accurate adjustment to the type or variety of potatoes being cleaned.

As potatoes are carried along on the table of this Grader they are continually turned over by the action of the rollers. All sides of the tubers come in contact first with the wing type brushes, which revolve in a direction opposite to the flow of potatoes and perform most of the cleaning.

Next the potatoes pass under the cloth wipers, which revolve at a higher speed in the direction of the flow of potatoes. These wipers complete the cleaning and give the extra polish which materially adds to their appearance.

As the clockwise rotation of the brushes tends to hold back the flow of potatoes, the amount of brushing the tubers receive can be regulated by the speed with which potatoes are fed into the equipment.

The Brusher is regularly equipped with a dust collector which carries dust from the cleaning operation outside of the building.

A Grader equipped with the Brusher can be easily changed from a grading-and-cleaning outfit to a strictly grading equipment, or *vice versa,* as it takes only a moment to fasten the cleaning unit up out of the way.

This feature is particularly important when there is a rush shipment and the tubers have not had time to dry, for potatoes must be reasonably dry to do a satisfactory cleaning job.

LONG ISLAND

Accurate figures are not available as to the acreage of potatoes planted in Suffolk County, Long Island, this season. A reduction in acreage has occurred and it is estimated that the 1933 acreage is 80 to 90% of the acreage planted last season. Green Mountains and Cobblers are the only varieties grown in this County except for a very small acreage of Bliss Triumphs grown for seed purposes.

A cold, rainy spring delayed planting, so that some growers were not able to complete their planting until late April. Ordinarily, the crop is in the ground by April 15th. It is a little too early to accurately judge the stands, but in general they do not appear as even as normal. Evidently the cold, wet spring has caused some seed piece decay. The crop as a whole appears to be at least two weeks later than usual at this time of year.

The Long Island Potato Tour which has been held annually for the past fifteen years will not be held this year for reasons of economy. —W. G. Been.

PENNSYLVANIA

Yeagle Brothers, of Bristol, with 626 bushels of potatoes on a measured acre, produced the largest yield of potatoes in Pennsylvania in 1932. Sweet clover preceded the potato crop and was plowed under in the spring. They planted 27 bushels of Northern Michigan Russet Rurals per acre. The seed pieces, 10 inches apart in 32 inch rows, were planted 3½ inches deep. The crop was planted on May 19 with a three row automatic planter. No manure was used in this field but a 3–10–10 fertilizer was applied in the row at the rate of 1500 pounds per acre. In addition, 799 pounds of 20 per cent super phosphate was broadcast. The crop was harrowed twice after planting, the weeder was used five times and two cultivations were made. Twelve spray applications were made at a pressure of approximately 350 pounds.

The A. B. Farquhar Co., Ltd., of York, has announced a Farquhar-Iron Age crop price adjustment guarantee plan for wheat and potatoes. This plan of "sharing the risk" by the manufacturer of farm machinery has been adopted for other crops but it apparently is a new departure in the case of the potato. In the plan announced, the base price for potatoes is $1.25 per hundred pounds, the quotations to be computed on daily reports furnished by Federal-State Market News Service, based upon sales to jobbers of U. S. No. 1 potatoes, f. o. b. Philadelphia, Pa., railroad deliveries. The company announces that, if through Federal legislation or other governmental action the return to the farmer equals $1.25 per hundred pounds their offer is automatically cancelled, but if less than this price, adjustment will be made on this basis.
